

What is the relationship between the intake of milk and milk products and serum cholesterol?

Conclusion

Insufficient evidence is available to assess the relationship between intake of milk and milk products and serum cholesterol levels.

Grade: Limited

Overall strength of the available supporting evidence: Strong; Moderate; Limited; Expert Opinion Only; Grade not assignable For additional information regarding how to interpret grades, [click here](#).

Evidence Summary Overview

Few studies have been conducted on the relationship between the intake of milk and milk products and blood cholesterol, although the high saturated fat content of milk fat would theoretically support a positive association with whole milk products. Three articles published since 2004 were reviewed on this topic: A randomized trial (Bowen, 2005), a prospective cohort study (Snijder, 2008) and a cross-sectional study (Houston, 2008).

In the dairy product feeding study (Bowen, 2005), intake of milk products was associated with reduced blood cholesterol, although this was associated with weight loss in the study. In a study of Dutch elderly (Snijder, 2008), baseline dairy consumption was not associated with changes in serum lipid levels over 6.4 years. A study of National Health and Nutrition Examination Surveys (NHANES) III data found that in women, more frequent cheese consumption was associated with higher high-density lipoprotein cholesterol (HDL-C) and lower low-density lipoprotein cholesterol (LDL-C) ($P < 0.05$), while in men, more frequent cheese consumption was associated with higher body mass index (BMI), waist circumference (WC), HDL-C and LDL-C ($P < 0.05$). Thus, intake of milk and milk products in recent studies did not always show expected increases in total blood cholesterol and may be linked to increased HDL-C.

Evidence Summary Paragraphs

Randomized Controlled Trial

Bowen et al, 2005 (positive quality) conducted a randomized controlled trial (RCT) to compare the effects on weight, body composition, metabolic parameters and risk markers of two isocaloric, energy-restricted high protein diets that differ in dietary calcium (Ca) and protein source on weight loss and body composition in healthy, overweight adults ($N=50$, 30 women and 20 men, ages 25 to 64 years). The study was conducted in Australia. The intervention diets were a high dairy protein and high-calcium (DP, 2,400 mg Ca per day) diet and a high mixed protein and moderate calcium (MP, 500mg Ca per day) diet followed for a 12-week energy restriction phase, followed by a four-week energy balance phase. After 16 weeks, subjects showed significant reductions in total weight (-9.7 ± 3.8 kg), fat mass (-8.3 ± 0.4 kg) and lean mass (-1.6 ± 0.3 kg), but there were no significant (NS) differences between the two diet groups. Also, subjects experienced significant improvements in total cholesterol (TC), LDL-C and triglycerides (TG) between baseline and 16-week dietary treatment; however, these differences were independent of dietary intervention. The authors

concluded that weight loss following energy-restricted, high protein diets is not affected by dietary calcium or protein source. In addition, lipid profile improved with weight loss independent of dietary protein source or calcium intake.

Prospective Cohort Study



Snijder et al, 2008 (positive quality), a prospective cohort study conducted in the Netherlands, investigated the association between dairy consumption and changes in weight and metabolic disturbances, based on data from the Hoorn study, a population-based cohort of white men and women aged 50 to 75 years. Average food intake was measured at baseline using a 92-item semi-quantitative food-frequency questionnaire (FFQ). At baseline and follow-up, participants underwent an extensive physical examination and a blood sample was drawn for biochemical analyses of fasting glucose, post-load glucose, HDL-C and LDL-C and TG. During the physical examination, weight, waist circumference and blood pressure (BP) were measured. 1,124 participants were included in the analysis. Baseline dairy consumption was not associated with 6.4-year changes in serum lipid levels. The authors concluded that dairy consumption was not associated with changes in metabolic variables in a Dutch elderly population.


Cross-Sectional Study

Houston et al, 2008 (positive quality), a cross-sectional study conducted in the US, examined the association between the frequency of cheese consumption and several cardiovascular risk factors, including measures of body fat, blood lipids, BP and blood glucose, using data from NHANES III. A total of 10,872 participants, aged 25 to 75 years, had complete data and were included in the analysis. Cheese consumption (combined full- and low-fat) was assessed through a FFQ asking one question about cheese and two questions about the consumption of foods containing large amounts of cheese. Categories of cheese consumption were 0, 1 to 4, 5 to 12, 13 to 29 and 30-plus servings per month. In women, more frequent cheese consumption was associated with higher HDL-C and lower LDL-C ($P<0.05$), while in men, more frequent cheese consumption was associated with higher BMI, WC, HDL-C and LDL-C ($P<0.05$). Authors concluded that moderate cheese consumption does not appear to be associated with a worse cardiovascular disease (CVD) risk profile in men or women, and that the gender differences observed may be due to types of cheese consumed.

 [View table in new window](#)

Author, Year, Study Design, Class, Rating	Participants	Description of Study Design	Outcomes
Bowen J, Noakes M et al, 2005 Study Design: Randomized Controlled Trial Class: A	N=50 (30 women, 20 men). Age: 25 to 64 years. Location: Australia.	Compared effects of two isocaloric, energy-restricted high PRO diets that differ in dietary Ca and PRO source on weight loss and body composition. Intervention diets were a high dairy PRO and high-Ca (DP, 2,400mg Ca per day)	After 16 weeks, subjects showed significant ↓ in total weight ($-9.7\pm3.8\text{kg}$), fat mass ($-8.3\pm0.4\text{kg}$) and lean mass ($-1.6\pm0.3\text{kg}$), but NS differences between the two diet groups. Also, subjects experienced significant improvements in TC, LDL-C and TG between baseline and


Rating: 		diet and a high mixed PRO and moderate Ca (MP, 500mg Ca per day) diet followed for a 12-week energy restriction phase, followed by a four-week energy balance phase.	16-week dietary treatment; however, differences were independent of dietary intervention. Authors concluded that weight ↓ following energy-restricted, high PRO diets is not affected by dietary Ca or PRO source. In addition, lipid profile improved with weight ↓ independent of dietary PRO source or Ca intake.
Houston et al 2008 Study Design: Cross-sectional Study Class: D Rating: 	N=10,872 NHANES III participants. Age: 25 to 75 years. Location: United States.	Examined association between the frequency of cheese consumption and several cardiovascular risk factors, including measures of body fat, blood lipids, BP and BG, using data from NHANES III. Cheese consumption (combined full and low-fat) assessed through FFQ asking one question about cheese and two questions about consumption of foods containing large amounts of cheese. Categories of cheese consumption were 0, 1 to 4, 5 to 12, 13 to 29 and 30-plus servings per month.	In women, more frequent cheese consumption was associated with higher HDL-C and lower LDL-C ($P<0.05$), while in men, more frequent cheese consumption was associated with higher BMI, WC, HDL-C and LDL-C ($P<0.05$). Authors concluded that moderate cheese consumption does not appear to be associated with a worse CVD risk profile in men or women, and that gender differences observed may be due to types of cheese consumed.
Snijder et al 2008 Study Design: Prospective Cohort Study	N=1,124 (Hoorn study, a population-based cohort of white men and women) Age: 50 to 75	Investigated association between dairy consumption and Δ in weight and metabolic disturbances. Average food intake measured at baseline	Baseline dairy consumption not associated with 6.4-year Δ in serum lipid levels. Authors concluded that dairy consumption not associated


Class: B	years.	using a 92-item semiquantitative FFQ.	with Δ in metabolic variables in a Dutch elderly population.
Rating: 	Location: The Netherlands.	At baseline and follow-up, participants underwent an extensive physical exam and blood sample was drawn for biochemical analyses of fasting glucose, post-load glucose, HDL-C and LDL-C and TG. During physical exam, weight, WC and BP were measured.	


Research Design and Implementation Rating Summary

For a summary of the Research Design and Implementation Rating results, [click here](#).

Worksheets

 [Bowen J, Noakes M, Clifton PM. Effect of calcium and dairy foods in high protein, energy-restricted diets on weight loss and metabolic parameters in overweight adults. *Int J Obes \(Lond\)*. 2005 Aug; 29\(8\): 957-965.](#)

 [Houston DK, Driver KE, Bush AJ, Kritchevsky SB. The association between cheese consumption and cardiovascular risk factors among adults. *J Hum Nutr Diet*. 2008 Apr;21\(2\):129-40.](#)

 [Snijder MB, van Dam RM, Stehouwer CD, Hiddink GJ, Heine RJ, Dekker JM. A prospective study of dairy consumption in relation to changes in metabolic risk factors: the Hoorn Study. *Obesity \(Silver Spring\)*. 2008 Mar;16\(3\):706-9. Epub 2008 Jan 17.](#)